ature of 284° to 302° F. The material is washed several times for freeing it from the mingled sodium chloride and sodium hydrate, and the camphor resulting from this operation is treated in the following manner:

In an autoclave constructed for the purpose, camphene and water strongly mixed with sulphuric acid are introduced and heated so as to attain 9 pounds of pressure. Then an electric current is applied, capable of producing the decomposition of water. The mass is constantly stirred, either mechanically or more simply by allowing a little of the steam to escape by a tap. In an hour, at least, the material is drawn from the apparatus, washed and dried, sublimed according to need, and is then suitable for replacing camphor in its industrial employments, for the camphene is converted entirely or in greater part into camphor, either right-hand camphor, or a product optically inactive, according to the origin of the oil of turpentine made use of.

In the electrolytic oxidation of the camphene, instead of using acidulated water, whatever is capable of furnishing, under the influence of the electric current, the oxygen necessary for the reaction, such as oxygenized water, barium bioxide, and the permanganates, may be employed.

Plastic and Elastic Composition.—Formaldehyde has the property, as known, of removing from gelatin its solubility and its fusibility, but it has also another property, prejudicial in certain applications, of rendering the composition hard and friable. In order to remedy this prejudicial action M. Deborda adds to the gelatin treated by means of formaldehyde, oil of turpentine, or a mixture of oil of turpentine and German turpentine or Venice turpentine. The addition removes from the composition its friability and hardness, imparting to it great softness and elasticity. The effect is accomplished by a slight proportion, 5 to 10 per cent.

Production of Substances Resembling Celluloid.—Most of the substitutes for camphor in the preparation of celluloid are attended with inconveniences limiting their employment and sometimes causing their rejection. Thus, in one case the celluloid does not allow of the preparation of transparent bodies; in another it occasions too much softness in the products manufactured; and in still another it does not allow of pressing, folding, or other operations, because the mass is too brittle; in still others combinations are produced which in time are affected unfavorably by the coloring substances employed.

Callenberg has found that the halogenous derivatives of etherized oils, principally oil of turpentine, and especially the solid chloride of turpentine, which is of a snowy and brilliant white, and of agreeable odor, are suitable for yielding, either alone or mixed with camphor or one of its substitutes, and combined by ordinary means with nitrated cellulose, or other ethers of cellulose, treated with acetic ether, a celluloidic product, which, it is said, is not inferior to ordinary celluloid and has the advantage of reduced cost.

Elastic Substitute for Celluloid.—Acetic cellulose, like nitro-cellulose, can be converted into an elastic corneous compound. The substances particularly suitable for the operation are organic substances containing one or more hydroxy, aldehydic, amide, or ketonic groups, as well as the acid amides. Probably a bond is formed when these combinations act on the acetate of cellulose, but the bond cannot well be defined, considering the complex nature of the molecule of cellulose. According to the mode of preparation, the substances obtained form a hard mass, more or less flexible. In the soft state, copies of engraved designs can be reproduced in their finest details. When hardened, they can be cut and polished. In certain respects they resemble celluloid, without its inflammability, and they can be employed in the same manner. They can be produced by the following methods—the Lederer process:

I.—Melt together 1 part of acetate of cellulose and 1½ parts of phenol at about the temperature of 104° to 122° F. When a clear solution is obtained place the mass of reaction on plates of glass or metal slightly heated and allow it to cool gradually. After a rest of several days the mass, which at the outset is similar to caoutchouc, is hard and forms flexible plates, which can be worked like celluloid.

II.—Compress an intimate mixture of equal parts of acetic cellulose and hydrate of chloride or of aniline, at a temperature of 122° to 140° F., and proceed as in the previous case.

In the same way a ketone may be employed, as acetophenone, or an acid amide, as acetamide.

III.—A transparent, celluloid-like substance which is useful for the produc-

tion of plates, tubes, and other articles, but especially as an underlay for sensitive films in photography, is produced by dissolving 1.8 parts, by weight, of nitrocellulose in 16 parts of glacial acetic acid, with heating and stirring and addition of 5 parts of gelatin. After this has swelled up, add 7.5 parts, by weight, of alcohol (96 per cent), stirring constantly. The syrupy product may be pressed into molds or poured, after further dilution with the said solvents in the stated proportion, upon glass plates to form thin layers. The dried articles are well washed with water, which may contain a trace of soda lye, and dried again. Photographic foundations produced in this manner do not change, nor attack the layers sensitive to light, nor do they become electric, and in developing they remain flat.

IV.—Viscose is the name of a new product of the class of substances like celluloid, pegamoid, etc., substances having most varied and valuable applications. It is obtained directly from cellulose by mascerating this substance in a 1 per cent dilution of hydrochloric acid. The maceration is allowed to continue for several hours, and at its close the liquid is decanted and the residue is pressed off and washed thoroughly. The mass (of which we will suppose there is 100 grams) is then treated with a 20 per cent aqueous solution of sodium hydrate, which dissolves it. The solution is allowed to stand for 3 days in a tightly closed vessel; 100 grams carbon disulphide are then added, the vessel closed and allowed to stand for 12 hours longer, when it is ready for purification. Viscose thus formed is soluble in water, cold or tepid, and yields a solution of a pale brownish color, from which it is precipitated by alcohol and sodium chloride, which purifies it, but at the expense of much of its solubility. A solution of the precipitated article is colorless, or of a slightly pale yellow. Under the action of heat, long continued, viscose is decomposed, yielding cellulose, caustic soda, and carbon disulphide.

See also Casein for Celluloid Substitutes.

Celluloid of Reduced Inflammability.—I.—A practicable method consists in incorporating silica, which does not harm the essential properties of the celluloid. The material is divided by the usual methods, and dissolved by means of the usual solvents, to which silica has been added, either in the state of amylic, ethylic, or methylic silicate, or in the state of any ether derivative of silicic acid. The suitable proportions vary according to the degree of inflammability desired, and according to the proportion of silica in the ether derivative employed; but sufficient freedom from inflammability for practical purposes is attained by the following proportions: Fifty-five to 65 parts in volume of the solvent of the celluloid, and 35 to 45 parts of the derivative of silicic acid.

When the ether derivative is in the solid form, such, for instance, as ethyl disilicate, it is brought to the liquid state by means of any of the solvents. The union of the solvent and of the derivative is accomplished by mixing the two liquids and shaking out the air as much as possible. The incorporation of this mixture with the celluloid, previously divided or reduced to the state of chips, is effected by pouring the mixture on the chips, or inversely, shaking or stirring as free from the air as possible. The usual methods are employed for the desiccation of the mass. A good result is obtained by drying very slowly, preferably at a temperature not above 10° C. (50° F.). The resulting residue is a new product scarcely distinguished from ordinary celluloid, except that the inherent inflammability is considerably reduced. It is not important to employ any individual silicate or derivative. A mixture of the silicates or derivatives mentioned will accomplish the same results.

II.—Any ignited body is extinguished in a gaseous medium which is unsuitable for combustion; the attempt has therefore been made to find products capable of producing an uninflammable gas; and products have been selected that yield chlorine, and others producing bromine; it is also necessary that these bodies should be soluble in a solvent of celluloid; therefore, among chlorated products, ferric chloride has been taken; this is soluble in the ether-alcohol mixture.

This is the process: An ether-alcohol solution of celluloid is made; then an ether-alcohol solution of ferric perchloride. The two solutions are mingled, and a clear, syrupy liquid of yellow color, yielding no precipitate, is obtained. The liquid is poured into a cup or any suitable vessel; it is left for spontaneous evaporation, and a substance of shell-color is produced, which, after washing and drying, effects the desired result. The celluloid thus treated loses none of its properties in pliability and transparency, and is not only uninflammable, but also incombustible.

Of bromated compounds, calcium bromide has been selected, which produces nearly the same result; the product obtained fuses in the flame; outside, it is extinguished, without the power of ignition.

It may be objected that ferric perchloride and calcium bromide, being soluble in water, may present to the celluloid a surface capable of being affected by moist air; but the mass of celluloid, not being liable to penetration by water, fixes the chlorinated or brominated product. Still, as the celluloid undergoes a slight decomposition, on exposure to the light, allowing small quantities of camphor to evaporate, the surface of the perchlorinated celluloid may be fixed by immersion in albuminous water, after previous treatment with a solution of oxalic acid, if a light yellow product is desired.

For preventing the calcium bromide from eventually oozing on the surface of the celluloid, by reason of its deliquescence, it may be fixed by immersing the celluloid in water acidulated with sulphuric acid. For industrial products, such as toilet articles, celluloid with ferric perchloride may be employed.

Another method of preparing an uninflammable celluloid, based on the principle above mentioned, consists in mixing bromide of camphor with cotton powder, adding castor oil to soften the product, in order that it may be less brittle. The latter product is not incombustible, but it is uninflammable, and its facility of preparation reduces at least one-half the apparatus ordinarily made use of in the manufacture of celluloid. The manufacture of this product is not at all dangerous, for the camphor bromide is strictly uninflammable, and may be melted without any danger of dissolving the gun cotton.

III.—Dissolve 25 parts of ordinary celluloidin in 250 parts of acetone and add a solution of 50 parts of magnesium chloride in 150 parts of alcohol, until a paste results, which occurs with a proportion of about 100 parts of the former solution to 20 parts of the latter solution. This paste is carefully mixed and worked through, then dried, and gives an absolutely incombustible material.

IV.—Glass-like plates which are impervious to acids, salts, and alkalies, flexible, odorless, and infrangible, and still possess a transparency similar to ordinary glass, are said to be obtained by dissolving 4 to 8 per cent of collodion wool (soluble pyroxylin) in 1 per cent of ether or alcohol and mixing the solution with 2 to 4 per cent of castor oil, or a similar non-resinifying oil, and with 4 to 6 per cent of Canada balsam. The inflammability of these plates is claimed to be much less than with others of collodion, and may be almost entirely obviated by admixture of magnesium chloride. An addition of zinc white produces the appearance of ivory.

Solvents for Celluloid.—Celluloid dissolves in acetone, sulphuric ether, alcohol, oil of turpentine, benzine, amyl acetate, etc., alone, or in various combinations of these agents. The following are some proportions for solutions of celluloid:

I.—Celluloid	.....	5 parts
Amyl acetate	.....	10 parts
Acetone	.....	16 parts
Sulphuric ether	....	16 parts
II.—Celluloid	.....	10 parts
Sulphuric ether	....	30 parts
Acetone	.....	30 parts
Amyl acetate	.....	30 parts
Camphor	.....	3 parts
III.—Celluloid	.....	5 parts
Alcohol	.....	50 parts
Camphor	.....	5 parts
IV.—Celluloid	.....	5 parts
Amyl acetate	.....	50 parts
V.—Celluloid	.....	5 parts
Amyl acetate	.....	25 parts
Acetone	.....	25 parts

Softening and Cementing Celluloid.—If celluloid is to be warmed only sufficiently to be able to bend it, a bath in boiling water will answer. In steam at 120° C. (248° F.), however, it becomes so soft that it may be easily kneaded like dough, so that one may even imbed in it metal, wood, or any similar material. If it be intended to soften it to solubility, the celluloid must then be scraped fine and macerated in 90 per cent alcohol, whereupon it takes on the character of cement and may be used to join broken pieces of celluloid together. Solutions of celluloid may be prepared: 1. With 5 parts, by weight, of celluloid in 16 parts, by weight, each of amyl acetate, acetone, and sulphuric ether. 2. With 10 parts, by weight, of celluloid in 30 parts, by weight, each of sulphuric ether, acetone, amyl acetate, and 4 parts, by weight, camphor. 3. With 5 parts, by weight, celluloid in 50 parts, by weight, alcohol and 5 parts, by weight, camphor. 4. With 5 parts, by weight, celluloid in 50 parts, by weight, amyl acetate. 5. With 5 parts, by weight, celluloid in 25 parts, by weight, amyl acetate and 25 parts, by weight, acetone.

It is often desirable to soften celluloid so that it will not break when hammered. Dipping it in water warmed to 40° C. (104° F.) will suffice for this.

Mending Celluloid.—Celluloid dishes which show cracks are easily repaired by brushing the surface repeatedly with alcohol, 3 parts, and ether, 4 parts, until the mass turns soft and can be readily squeezed together. The pressure must be maintained for about one day. By putting only 1 part of ether in 3 parts of alcohol and adding a little shellac, a cement for celluloid is obtained, which, applied warm, produces quicker results. Another very useful gluing agent for celluloid receptacles is concentrated acetic acid. The celluloid fragments dabbed with it stick together almost instantaneously.

See also Adhesives for Methods of Mending Celluloid.

Printing on Celluloid.—Printing on celluloid may be done in the usual way. Make ready the form so as to be perfectly level on the impression—that is, uniform to impressional touch on the face. The tympan should be hard. Bring up the form squarely, allowing for about a 3- or 4-sheet cardboard to be withdrawn from the tympan when about to proceed with printing on the celluloid; this is to allow for the thickness of the sheet of celluloid. Use live but dry and well-seasoned rollers. Special inks of different colors are made for this kind of presswork; in black a good card-job quality will be found about right, if a few drops of copal varnish are mixed with the ink before beginning to print.

Colored Celluloid.—

Black: First dip into pure water, then into a solution of nitrate of silver; let dry in the light.

Yellow: First immerse in a solution of nitrate of lead, then in a concentrated solution of chromate of potash.

Brown: Dip into a solution of permanganate of potash made strongly alkaline by the addition of soda.

Blue: Dip into a solution of indigo neutralized by the addition of soda.

Red: First dip into a diluted bath of nitric acid; then into an ammoniacal solution of carmine.

Green: Dip into a solution of verdigris.

Aniline colors may also be employed but they are less permanent.

Bleaching Celluloid.—If the celluloid has become discolored throughout, its whiteness can hardly be restored, but if merely superficially discolored, wipe with a woolen rag wet with absolute alcohol and ether mixed in equal proportions. This dissolves and removes a minute superficial layer and lays bare a new surface. To restore the polish rub briskly first with a woolen cloth and finish with silk or fine chamois. A little jeweler's rouge or putzpomade greatly facilitates matters. Ink marks may be removed in the same manner. Printer's ink may be removed from celluloid by rubbing first with oil of turpentine and afterwards with alcohol and ether.

Process of Impregnating Fabrics with Celluloid.—The fabric is first saturated with a dilute celluloid solution of the consistency of olive oil, which solution penetrates deeply into the tissue; dry quickly in a heating chamber and saturate with a more concentrated celluloid solution, about as viscous as molasses. If oil be added to the celluloid solution, the quantity should be small in the first solution, e. g., 1 to 2 per cent, in the following ones 5 to 8 per cent, while the outer layer contains very little or no oil. A fabric impregnated in this manner possesses a very flexible surface, because the outer layer may be very thin, while the interior consists of many flexible fibers surrounded by celluloid.

CELLULOID CEMENTS AND GLUES:
See Adhesives.

CELLULOID LACQUER:
See Lacquer.

CELLULOID PUTTY:
See Cements.

Cements

(See also Putties.)

For Adhesive Cements intended for repairing broken articles, see Adhesives.

Putty for Celluloid.—To fasten celluloid to wood, tin, etc., use a compound of 2 parts shellac, 3 parts spirit of camphor, and 4 parts strong alcohol.

Plumbers' Cement.—A plumbers' cement consists of 1 part black rosin, melted, and 2 parts of brickdust, thoroughly powdered and dried.

Cement for Steam and Water Pipes.—A cement for pipe joints is made as follows: Ten pounds fine yellow ocher; 4

pounds ground litharge; 4 pounds whiting, and ½ pound of hemp, cut up fine. Mix together thoroughly with linseed oil to about the consistency of putty.

Gutter Cement.—Stir sand and fine lime into boiled paint skins while hot and thick. Use hot.

Cement for Pipe Joints.—A good cement for making tight joints in pumps, pipes, etc., is made of a mixture of 15 parts of slaked lime, 30 parts of graphite, and 40 parts of barium sulphate. The ingredients are powdered, well mixed together, and stirred up with 15 parts of boiled oil. A stiffer preparation can be made by increasing the proportions of graphite and barium sulphate to 30 and 40 parts respectively, and omitting the lime. Another cement for the same purpose consists of 15 parts of chalk and 50 of graphite, ground, washed, mixed, and reground to fine powder. To this mixture is added 20 parts of ground litharge, and the whole mixed to a stiff paste with about 15 parts of boiled oil. This last preparation possesses the advantage of remaining plastic for a long time when stored in a cool place. Finally, a good and simple mixture for tightening screw connections is made from powdered shellac dissolved in 10 per cent ammonia. The mucinous mass is painted over the screw threads, after the latter have been thoroughly cleaned, and the fitting is screwed home. The ammonia soon volatilizes, leaving behind a mass which hardens quickly, makes a tight joint, and is impervious to hot and cold water.

Protection for Cement Work.—A coating of soluble glass will impart to cement surfaces exposed to ammonia not only a protective covering, but also increased solidness.

Cemented surfaces can be protected from the action of the weather by repeated coats of a green vitriol solution consisting of 1 part of green vitriol and 3 parts of water. Two coatings of 5 per cent soap water are said to render the cement waterproof; after drying and rubbing with a cloth or brush, this coating will become glossy like oil paint. This application is especially recommended for sick rooms, since the walls can be readily cleaned by washing with soapy water. The coating is rendered more and more waterproof thereby. The green vitriol solution is likewise commendable for application on old and new plastering, since it produces thereon waterproof coatings. From old plastering the loose particles have first to be removed by washing.

Puncture Cement.—A patented preparation for automatically repairing punctures in bicycle tires consists of glycerine holding gelatinous silica or aluminum hydrate in suspension. Three volumes of glycerine are mixed with 1 volume of liquid water glass, and an acid is stirred in. The resulting jelly is diluted with 3 additional volumes of glycerine, and from 4 to 6 ounces of this fluid are placed in each tire. In case of puncture, the internal pressure of the air forces the fluid into the hole, which it closes.

To Fix Iron in Stone.—Of the quickly hardening cements, lead and sulphur, the latter is popularly employed. It can be rendered still more suitable for purposes of pouring by the admixture of Portland cement, which is stirred into the molten sulphur in the ratio of 1 to 3 parts by weight. The strength of the latter is increased by this addition, since the formation of so coarse a crystalline structure as that of solidifying pure sulphur is disturbed by the powder added.

White Portland Cement.—Mix together feldspar, 40–100 parts, by weight; kaolin, 100 parts; limestone, 700 parts; magnesite, 20–40 parts; and sodium chloride, 2.5–5 parts, all as pure as possible, and heat to 1430° to 1500° C. (2606° to 2732° F.), until the whole has become sintered together, and forms a nice, white cement-like mass.

Cement for Closing Cracks in Stoves.—Make a putty of reduced iron (iron by hydrogen) and a solution of sodium or potassium silicate, and force it into the crack. If the crack be a very narrow one, make the iron and silicate into paste instead of putty. This material grows firmer and harder the longer the mended article is used.

Cement for Waterpipe.—I.—Mix together 11 parts, by weight, Portland cement; 4 parts, by weight, lead white; 1 part, by weight, litharge; and make to a paste with boiled oil in which 3 per cent of its weight of colophony has been dissolved.

II.—Mix 1 part, by weight, torn-up wadding; 1 part, by weight, of quicklime, and 3 parts, by weight, of boiled oil. This cement must be used as soon as made.

Cement for Pallet Stones.—Place small pieces of shellac around the stone when in position and subject it to heat. Often the lac spreads unevenly or swells up; and this, in addition to being unsightly, is apt to displace the stone. This can be avoided as follows: The pallets are

held in long sliding tongs. Take a piece of shellac, heat it and roll it into a cylinder between the fingers; again heat the extremity and draw it out into a fine thread. This thread will break off, leaving a point at the end of the lac. Now heat the tongs at a little distance from the pallets, testing the degree of heat by touching the tongs with the shellac. When it melts easily, lightly touch the two sides of the notch with it; a very thin layer can thus be spread over them, and the pallet stone can then be placed in position and held until cold enough. The tongs will not lose the heat suddenly, so that the stone can easily be raised or lowered as required. The projecting particles of cement can be removed by a brass wire filed to an angle and forming a scraper. To cement a ruby pin, or the like, one may also use shellac dissolved in spirit, applied in the consistency of syrup, and liquefied again by means of a hot pincette, by seizing the stone with it.

DENTAL CEMENTS:

Fairthorne's Cement.—Powdered glass, 5 parts; powdered borax, 4 parts; silicic acid, 8 parts; zinc oxide, 200 parts. Powder very finely and mix; then tint with a small quantity of golden ocher or manganese. The compound, mixed before use with concentrated syrupy zinc-chloride solution, soon becomes as hard as marble and constitutes a very durable tooth cement.

Huebner's Cement.—Zinc oxide, 500.0 parts; powdered manganese, 1.5 parts; yellow ocher, powdered, 1.5-4.0 parts; powdered borax, 10.0 parts; powdered glass, 100.0 parts.

As a binding liquid it is well to use acid-free zinc chloride, which can be prepared by dissolving pure zinc, free from iron, in concentrated, pure, hydrochloric acid, in such a manner that zinc is always in excess. When no more hydrogen is evolved the zinc in excess is still left in the solution for some time. The latter is filtered and boiled down to the consistency of syrup.

Commercial zinc oxide cannot be employed without previous treatment, because it is too loose; the denser it is the better is it adapted for dental cements, and the harder the latter will be. For this reason it is well, in order to obtain a dense product, to stir the commercial pure zinc oxide into a stiff paste with water to which 2 per cent of nitric acid has been added; the paste is dried and heated for some time at white heat in a Hessian crucible.

After cooling, the zinc oxide, thus obtained, is very finely powdered and kept in hermetically sealed vessels, so that it cannot absorb carbonic acid. The dental cement prepared with such zinc oxide turns very hard and solidifies with the concentrated zinc-chloride solution in a few minutes.

Phosphate Cement.—Concentrate pure phosphoric acid till semi-solid, and mix aluminum phosphate with it by heating. For use, mix with zinc oxide to the consistency of putty. The cement is said to set in 2 minutes.

Zinc Amalgam, or Dentists' Zinc.—This consists of pure zinc filings combined with twice their weight of mercury, a gentle heat being employed to render the union more complete. It is best applied as soon as made. Its color is gray, and it is said to be effective and durable.

Sorel's Cement.—Mix zinc oxide with half its bulk of fine sand, add a solution of zinc chloride of 1.260 specific gravity, and rub the whole thoroughly together in a mortar. The mixture must be applied at once, as it hardens very quickly.

Metallic Cement.—Pure tin, with a small proportion of cadmium and sufficient mercury, forms the most lasting and, for all practical purposes, the least objectionable amalgam. Melt 2 parts of tin with 1 of cadmium, run it into ingots, and reduce it to filings. Form these into a fluid amalgam with mercury, and squeeze out the excess of the latter through leather. Work up the solid residue in the hand, and press it into the tooth. Or melt some beeswax in a pipkin, throw in 5 parts of cadmium, and when melted add 7 or 8 parts of tin in small pieces. Pour the melted metals into an iron or wooden box, and shake them until cold, so as to obtain the alloy in a powder. This is mixed with 2½ to 3 times its weight of mercury in the palm of the hand, and used as above described.

CEMENT FOR FILM:

To cement together celluloid and cinematograph films use the following—

Soak 25 ounces isinglass in cold water until it becomes soft, then press out the superfluous water and place it in a pan over heat until it becomes tacky or into a heavy liquid.

Separately dissolve in 5 ounces of alcohol, 2 ounces of gum ammoniac and 1 ounce of gum mastic and into this add the isinglass liquid. Stir the resulting

heavy cement rather briskly until well mixed. Clean well celluloid pieces to be cemented before using above cement.

CHALK FOR TAILORS.

Knead together ordinary pipe clay, moistened with ultramarine blue for blue, finely ground ocher for yellow, etc., until they are uniformly mixed, roll out into thin sheets, cut and press into wooden or metallic molds, well oiled to prevent sticking, and allow to dry slowly at ordinary temperature or at a very gentle heat.

CHAPPED HANDS:
See Cosmetics.

CHARTA SINAPIS:
See Mustard Paper.

CHARTREUSE:
See Wines and Liquors.

Ceramics

GROUND CERAMICS—LAYING OIL FOR:
See Oil.

Notes for Potters, Glass-, and Brickmakers.—It is of the highest importance in selecting oxides, minerals, etc., for manufacturing different articles, for potters' use, to secure pure goods, especially in the purchase of the following: Lead, manganese, oxide of zinc, borax, whiting, oxide of iron, and oxide of cobalt. The different ingredients comprising any given color or glaze should be thoroughly mixed before being calcined, otherwise the mass will be of a streaky or variegated kind. Calcination requires care, especially in the manufacture of enamel colors. Over-firing, particularly of colors or enamels composed in part of lead, borax, antimony, or litharge, causes a dullness of shade, or film, that reduces their value for decorative purposes, where clearness and brilliancy are of the first importance.

To arrest the unsightly defect of "crazing," the following have been the most successful methods employed, in the order given:

I.—Flux made of 10 parts tincal; 4 parts oxide of zinc; 1 part soda.

II.—A calcination of 5 parts oxide of zinc; 1 part pearl ash.

III.—Addition of raw oxide of zinc, 6 pounds to each hundredweight of glaze.

To glazed brick and tile makers, whose chief difficulty appears to be the production of a slip to suit the contraction of their clay, and adhere strongly to either a clay or a burnt brick or tile, the following method may be recommended:

Mix together:

Ball clay	10 parts
Cornwall stone	10 parts
China clay	7 parts
Flint	6½ parts

To be mixed and lawned one week before use.

To Cut Pottery.—Pottery or any soft or even hard stone substance can be cut without chipping by a disk of soft iron, the edge of which has been charged with emery, diamond, or other grinding powder, that can be obtained at any tool agency. The cutting has to be done with a liberal supply of water fed continually to the revolving disk and the substance to be cut.

BRICK AND TILEMAKERS' GLAZED BRICKS:

White.—When the brick or tile leaves the press, with a very soft brush cover the part to be glazed with No. 1 Slip; afterwards dip the face in the same mixture.

No. 1 Slip.—

Same clay as brick	9 parts
Flint	1 part
Ball clay	5 parts
China	4 parts

Allow the brick to remain slowly drying for 8 to 10 hours, then when moist dip in the white body.

White Body.—

China clay	24 parts
Ball clay	8 parts
Feldspar	8 parts
Flint	4 parts

The brick should now be dried slowly but thoroughly, and when perfectly dry dip the face in clean cold water, and immediately afterwards in glaze.

Hard Glaze.—

Feldspar	18 parts
Cornwall stone	3½ parts
Whiting	1½ parts
Oxide of zinc	1½ parts
Plaster of Paris	¾ part

Soft Glaze.—

White lead	13 parts
Feldspar	20 parts
Oxide of zinc	3 parts
Plaster of Paris	1 part
Flint glass	13 parts
Cornwall stone	3½ parts
Paris white	1¼ parts

Where clay is used that will stand a very high fire, the white lead and glass may be left out. A wire brush should now be used to remove all superfluous glaze, etc., from the sides and ends of the brick, which is then ready for the kiln. In placing, set the bricks face to face, about an inch space being left between the two glazed faces. All the mixtures, after being mixed with water to the consistency of cream, must be passed 2 or 3 times through a very fine lawn. The kiln must not be opened till perfectly cold.

Process for Colored Glazes.—Use color, 1 part, to white body, 7 parts. Use color, 1 part, to glaze, 9 parts.

Preparation of Colors.—The specified ingredients should all be obtained finely ground, and after being mixed in the proportions given should, in a saggar or some clay vessel, be fired in the brick kiln and afterwards ground for use. In firing the ingredients the highest heat attainable is necessary.

Turquoise.—

Oxide of zinc	8 parts
Oxide of cobalt	1¼ parts

Grass Green.—

Oxide of chrome	6 parts
Flint	1 part
Oxide of copper	½ part

Royal Blue.—

Pure alumina	20 parts
Oxide of zinc	8 parts
Oxide of cobalt	4 parts

Mazarine Blue.—

Oxide of cobalt	10 parts
Paris white	9 parts
Sulphate barytes	1 part

Red Brown.—

Oxide of zinc	40 parts
Crocus of martis	6 parts
Oxide of chrome	6 parts
Red lead	5 parts
Boracic acid	5 parts
Red oxide of iron	1 part

Orange.—

Pure alumina	5 parts
Oxide of zinc	2 parts
Bichromate of potash.	1 part
Iron scale	½ part

Claret Brown.—

Bichromate of potash.	2 parts
Flint	2 parts
Oxide of zinc	1 part
Iron scale	1 part

Blue Green.—

Oxide of chrome	6 parts
Flint	2 parts
Oxide of cobalt	¾ part

Sky Blue.—

Flint	9 parts
Oxide of zinc	13 parts
Cobalt	2½ parts
Phosphate soda	1 part

Chrome Green.—

Oxide of chrome	3 parts
Oxide of copper	1 part
Carbonate of cobalt	1 part
Oxide of cobalt	2 parts

Olive.—

Oxide of chrome	3 parts
Oxide of zinc	2 parts
Flint	5 parts
Oxide of cobalt	1 part

Blood Red.—

Oxide of zinc	30 parts
Crocus martis	7 parts
Oxide of chrome	7 parts
Litharge	5 parts
Borax	5 parts
Red oxide of iron	2 parts

Black.—

Chromate of iron	24 parts
Oxide of nickel	2 parts
Oxide of tin	2 parts
Oxide of cobalt	5 parts

Imperial Blue.—

Oxide of cobalt	10 parts
Black color	1½ parts
Paris white	7½ parts
Flint	2½ parts
Carbonate of soda	1 part

Mahogany.—

Chromate of iron	30 parts
Oxide of manganese	20 parts
Oxide of zinc	12 parts
Oxide of tin	4 parts
Crocus martis	2 parts

Gordon Green.—

Oxide of chrome	12 parts
Paris white	8 parts
Bichromate of potash.	4½ parts
Oxide of cobalt	⅝ part

Violet.—

Oxide of cobalt	2½ parts
Oxide of manganese	4 parts
Oxide of zinc	8 parts
Cornwall stone	8 parts

Lavender.—

Calcined oxide of zinc	5 parts
Carbonate of cobalt	¾ part
Oxide of nickel	¼ part
Paris white	1 part

Brown.—

Manganese	4 parts
Oxide of chrome	2 parts
Oxide of zinc	4 parts
Sulphate barytes	2 parts

Dove.—

Oxide of nickel	7 parts
Oxide of cobalt	2 parts
Oxide of chrome	1 part
Oxide of flint	18 parts
Paris white	3 parts

Yellow Green.—

Flint	6 parts
Paris white	4 parts
Bichromate of potash	4½ parts
Red lead	2 parts
Fluorspar	2 parts
Plaster of Paris	1½ parts
Oxide of copper	½ part

BODIES REQUIRING NO STAIN:

Ivory.—

Cane marl	16 parts
Ball clay	12 parts
Feldspar	8 parts
China clay	6 parts
Flint	4 parts

Cream.—

Ball clay	22 parts
China clay	5½ parts
Flint	5 parts
Feldspar	3½ parts
Cane marl	12 parts

Black.—

Ball clay	120 parts
Ground ocher	120 parts
Ground manganese	35 parts

Buff.—

Ball clay	12 parts
China clay	10 parts
Feldspar	8 parts
Bull fire clay	16 parts
Yellow ocher	3 parts

Drab.—

Cane marl	30 parts
Ball clay	10 parts
Stone	7 parts
Feldspar	4 parts

Brown.—

Red marl	50 parts
China clay	7 parts
Ground manganese	6 parts
Feldspar	3 parts

In making mazarine blue glazed bricks use the white body and stain the glaze only.

Mazarine blue	1 part
Glaze	7 parts

For royal blue use 1 part stain to 6 parts white body, and glaze unstained.

Blood-Red Stain.—Numerous brick manufacturers possess beds of clay from which good and sound bricks or tiles can be made, the only drawback being that the clay does not burn a good color. In many cases this arises from the fact that the clay contains more or less sulphur or other impurity, which spoils the external appearance of the finished article. The following stain will convert clay of any color into a rich, deep red, mixed in proportions of stain, 1 part, to clay, 60 parts.

Stain.—

Crocus martis	20 parts
Yellow ocher	4 parts
Sulphate of iron	10 parts
Red oxide of iron	2 parts

A still cheaper method is to put a slip or external coating upon the goods. The slip being quite opaque, effectively hides the natural color of the brick or tile upon which it may be used.

The process is to mix:

Blood-red stain	1 part
Good red clay	6 parts

Add water until the mixture becomes about the consistency of cream, then with a sponge force the liquid two or three times through a very fine brass wire lawn, No. 80, and dip the goods in the liquid as soon as they are pressed or molded.

Blue Paviors.—Blue paving bricks may be produced with almost any kind of clay that will stand a fair amount of heat, by adopting the same methods as in the former case of blood-red bricks, that is, the clay may be stained throughout, or an outside coating may be applied.

Stain for Blue Paviors.—

Ground ironstone	20 parts
Chromate of iron	5 parts
Manganese	6 parts
Oxide of nickel	1 part

Use 1 part clay and 1 part stain for coating, and 50 or 60 parts clay and 1 part stain for staining through.

Fire blue paviors very hard.

Buff Terra-Cotta Slip.—

Buff fire clay	16 parts
China clay	6 parts

Yellow ocher	3	parts
Ball clay	10	parts
Flint	4	parts

Add water to the materials after mixing well, pass through the fine lawn, and dip the goods when soft in the liquid.

Transparent Glaze.—

Ground flint glass	4	parts
Ground white lead	4	parts
Ground oxide of zinc	¼	part

This glaze is suitable for bricks or tiles made of very good red clay, the natural color of the clay showing through the glaze. The goods must first be fired sufficiently hard to make them durable, afterwards glazed, and fired again. The glaze being comparatively soft will fuse at about half the heat required for the first burning. The glaze may be stained, if desired, with any of the colors given in glazed-brick recipes, in the following proportions: Stain, 1 part; glaze, 1 part.

SPECIAL RECIPES FOR POTTERY AND BRICK AND TILE WORKS:

Vitrifiable Bodies.—The following mixtures will flux only at a very high heat. They require no glaze when a proper heat is attained, and they are admirably adapted for stoneware glazes.

I.—Cornwall stone	20	parts	
Feldspar	12	parts	
China clay	3	parts	
Whiting	2	parts	
Plaster of Paris	1½	parts	
II.—Feldspar	30	parts	
Flint	9	parts	
Stone	8	parts	
China clay	3	parts	
III.—Feldspar	20	parts	
Stone	5	parts	
Oxide of zinc	3	parts	
Whiting	2	parts	
Plaster of Paris	1	part	
Soda crystals, dissolved	1	part	

Special Glazes for Bricks or Pottery at One Burning.—To run these glazes intense heat is required.

I.—Cornwall stone	40	parts
Flint	7	parts
Paris white	4	parts
Ball clay	15	parts
Oxide of zinc	6	parts
White lead	15	parts
II.—Feldspar	20	parts
Cornwall stone	5	parts
Oxide of zinc	3	parts
Flint	3	parts
Lynn sand	1½	parts
Sulphate barytes	1½	parts
III.—Feldspar	25	parts
Cornwall stone	6	parts
Oxide of zinc	2	parts
China clay	2	parts
IV.—Cornwall stone	118	parts
Feldspar	40	parts
Paris white	28	parts
Flint	4	parts
V.—Feldspar	16	parts
China clay	4	parts
Stone	4	parts
Oxide of zinc	2	parts
Plaster of Paris	1	part
VI.—Feldspar	10	parts
Stone	5	parts
Flint	2	parts
Plaster	½	part

The following glaze is excellent for bricks in the biscuit and pottery, which require an easy firing:

White.—

White lead	20	parts
Stone	9	parts
Flint	9	parts
Borax	4	parts
Oxide of zinc	2	parts
Feldspar	3	parts

These materials should be procured finely ground, and after being thoroughly mixed should be placed in a fire-clay crucible, and be fired for 5 or 6 hours, sharply, or until the material runs down into a liquid, then with a pair of iron tongs draw the crucible from the kiln and pour the liquid into a bucket of cold water, grind the flux to an extremely fine powder, and spread a coating upon the plate to be enameled, previously brushing a little gum thereon. The plate must then be fired until a sufficient heat is attained to run or fuse the powder.

POTTERY BODIES AND GLAZES:

Ordinary.—

I.—China clay	2½	parts
Stone	1½	parts
Bone	3	parts
II.—China clay	5	parts
Stone	2½	parts
Bone	7	parts
Barytes	3	parts
III.—Chain clay	5	parts
Stone	3	parts
Flint	¼	part
Barytes	8	parts

Superior.—

I.—China clay	35	parts
Cornwall stone	23	parts
Bone	40	parts
Flint	2	parts

II.—China clay..... 35 parts
Cornwall stone..... 8 parts
Bone..... 50 parts
Flint..... 3 parts
Blue clay..... 4 parts

III.—China clay..... 8 parts
Cornwall stone..... 40 parts
Bone..... 29 parts
Flint..... 5 parts
Blue clay..... 18 parts

IV.—China clay..... 32 parts
Cornwall stone..... 23 parts
Bone..... 34 parts
Flint..... 6 parts
Blue clay..... 5 parts

V.—China clay..... 7 parts
Stone..... 40 parts
Bone..... 28 parts
Flint..... 5 parts
Blue clay..... 20 parts

Finest China Bodies.—

I.—China clay..... 20 parts
Bone..... 60 parts
Feldspar..... 20 parts

II.—China clay..... 30 parts
Bone..... 40 parts
Feldspar..... 30 parts

III.—China clay..... 25 parts
Stone..... 10 parts
Bone..... 45 parts
Feldspar..... 20 parts

IV.—China clay..... 30 parts
Stone..... 15 parts
Bone..... 35 parts
Feldspar..... 20 parts

Earthenware Bodies.—

I.—Ball clay.....13 parts
China clay..... 9½ parts
Flint..... 5½ parts
Cornwall stone..... 4 parts

II.—Ball clay.....12½ parts
China clay..... 8 parts
Flint..... 5½ parts
Cornwall stone..... 2½ parts
One pint of cobalt stain to 1 ton of glaze.

III.—Ball clay.....13¼ parts
China clay.....11 parts
Flint..... 4 parts
Cornwall stone..... 5 parts
Feldspar..... 4 parts
Stain as required.

IV.—Ball clay.....18½ parts
China clay.....13½ parts
Flint..... 8½ parts
Stone..... 4 parts
Blue stain, 2 pints to ton.

V.—Ball clay..... 15 parts
China clay..... 12 parts
Flint..... 6 parts
Stone..... 4 parts
Feldspar..... 4 parts
Blue stain, 2 pints to ton.

VI. (Parian).—
Stone..... 11 parts
Feldspar..... 10 parts
China clay..... 8 parts

COLORED BODIES:

Ivory Body.—
Ball clay.....22 parts
China..... 5½ parts
Flint..... 5 parts
Stone..... 3½ parts

Dark Drab Body.—
Cane marl..... 30 parts
Ball clay..... 10 parts
Cornwall stone..... 7 parts
Feldspar..... 4 parts

Black Body.—
Ball clay..... 120 parts
Ocher..... 120 parts
Manganese..... 35 parts
Cobalt carbonate.. 2 parts
Grind the three last mentioned ingredients first.

Caledonia Body.—
Yellow clay..... 32 parts
China clay..... 10 parts
Flint..... ¼ parts

Brown Body.—
Red clay.....50 parts
Common clay..... 7½ parts
Manganese..... 1 part
Flint..... 1 part

Jasper Body.—
Cawk clay.....10 parts
Blue clay.....10 parts
Bone..... 5 parts
Flint..... 2 parts
Cobalt..... ¼ part

Stone Body.—
Stone..... 48 parts
Blue clay..... 25 parts
China clay..... 24 parts
Cobalt..... 10 parts

Egyptian Black.—
Blue clay..... 235 parts
Calcined ocher.... 225 parts
Manganese..... 45 parts
China clay..... 15 parts

Ironstone Body.—
Stone..... 200 parts
Cornwall clay..... 150 parts

Blue clay	200 parts
Flint	100 parts
Calx	1 part

Cream Body.—

Blue clay	1½ parts
Brown clay	1½ parts
Black clay	1 part
Cornish clay	1 part
Common ball clay	¼ part
Buff color	¼ part

Light Drab.—

Cane marl	30 parts
Ball clay	24 parts
Feldspar	7 parts

Sage Body.—

Cane marl	15 parts
Ball clay	15 parts
China clay	5 parts

Stained with turquoise stain.

COLORED GLAZES FOR POTTERY:

Blue.—

White glaze	100 parts
Oxide of cobalt	3 parts
Red lead	10 parts
Flowing blue	3 parts
Enamel blue	3 parts

Grind.

Pink.—

White glaze	100 parts
Red lead	8 parts
Marone pink U. G.	8 parts
Enamel red	3 parts

Grind.

Buff.—

White glaze	100 parts
Red lead	10 parts
Buff color	8 parts

Grind.

Ivory.—

White glaze	100 parts
Red lead	8 parts
Enamel amber	8 parts
Yellow underglaze	2 parts

Grind.

Turquoise.—

White glaze	100 parts
Red lead	10 parts
Carbonate of soda	5 parts
Enamel blue	4 parts
Malachite, 110	4 parts

Grind.

Yellow.—

I.—

White glaze	100 parts
Red lead	10 parts
Oxide of uranium	8 parts

Grind.

II.—

Dried flint	5 parts
Cornwall stone	15 parts
Litharge	50 parts
Yellow underglaze	4 parts

Grind.

Green.—

I.—

Oxide of copper	8 parts
Flint of glass	3 parts
Flint	1 part
Red lead	6 parts

Grind, then take:

Of above	1 part
White glaze	6 parts

Or stronger as required.

II.—

Red lead	60 parts
Stone	24 parts
Flint	12 parts
Flint glass	12 parts
China clay	3 parts
Calcined oxide of copper	14 parts
Oxide of cobalt	¼ part

Grind only.

Green Glaze, Best.—

III.—

Stone	80 parts
Flint	8 parts
Soda crystals	4 parts
Borax	3½ parts
Niter	2 parts
Whiting	2 parts
Oxide of cobalt	¼ part

Glost fire, then take:

Above frit	60 parts
Red lead	57 parts
Calcined oxide of copper	5¼ parts

Black.—

Red lead	24 parts
Raddle	4 parts
Manganese	4 parts
Flint	2 parts
Oxide of cobalt	2 parts
Carbonate of cobalt	2 parts

Glost fire.

WHITE GLAZES:

China.—Frit:

I.—

Stone	6 parts
Niter	2 parts
Borax	12 parts
Flint	4 parts
Pearl ash	2 parts

To mill:

Frit	24 parts
Stone	15½ parts
Flint	6½ parts
White lead	31 parts

II.—Frit:

Stone	24 parts
Borax	53 parts
Lynn sand	40 parts
Feldspar	32 parts
Paris white	16 parts

To mill:

Frit	90 parts
Stone	30 parts
White lead	90 parts
Flint	4 parts
Glass	2 parts

III.—Frit:

Stone	50 parts
Borax	40 parts
Flint	30 parts
Flint glass	30 parts
Pearl barytes	10 parts

To mill:

Frit	160 parts
Red lead	30 parts
Enamel blue	½ part
Flint glass	2 parts

IV.—Frit:

Borax	100 parts
China clay	55 parts
Whiting	60 parts
Feldspar	75 parts

To mill:

Frit	200 parts
China clay	16 parts
White clay	3½ parts
Stone	3 parts
Flint	2 parts

V.—Frit:

Stone	40 parts
Flint	25 parts
Niter	10 parts
Borax	20 parts
White lead	10 parts
Flint glass	40 parts

To mill:

Frit	145 parts
Stone	56 parts
Borax	16 parts
Flint	15 parts
Red lead	60 parts
Flint glass	8 parts

Earthenware.—Frit:

I.—Flint 108 parts
China clay 45 parts
Paris white 60 parts
Borax 80 parts
Soda crystals 30 parts

To mill:

Frit	270 parts
Flint	20 parts
Paris white	15 parts
Stone	80 parts
White lead	65 parts

II.—Frit:

Flint	62 parts
China clay	30 parts
Paris white	38 parts
Boracic acid	48 parts
Soda crystals	26 parts

To mill:

Frit	230 parts
Stone	160 parts
Flint	60 parts
Lead	120 parts

III.—Frit:

Stone	56 parts
Paris white	55 parts
Flint	60 parts
China clay	20 parts
Borax	120 parts
Soda crystals	15 parts

To mill:

Frit	212 parts
Stone	130 parts
Flint	50 parts
Lead	110 parts

Stain as required.

IV.—Frit:

Stone	100 parts
Flint	44 parts
Paris white	46 parts
Borax	70 parts
Niter	10 parts

To mill:

Frit	200 parts
Stone	60 parts
Lead	80 parts

Pearl White Glaze.—Frit:

Flint	50 parts
Stone	100 parts
Paris white	20 parts
Borax	60 parts
Soda crystals	20 parts

To mill:

Frit	178 pounds
Lead	55 pounds
Stain	3 ounces

Opaque Glaze.—Frit:

Borax	74 parts
Stone	94 parts
Flint	30 parts
China clay	22 parts
Pearl ash	5½ parts

To mill:

Frit	175 parts
Lead	46 parts

Flint	10 parts
Oxide of tin	12 parts
Flint glass	12 parts

Glaze for Granite.—Frit:

I.—Stone	100 parts
Flint	80 parts
China clay	30 parts
Paris white	30 parts
Feldspar	40 parts
Soda crystals	40 parts
Borax	80 parts

To mill:

Frit	360 parts
Flint	50 parts
Stone	50 parts
Lead	80 parts

II.—Frit:

Borax	100 parts
Stone	50 parts
Flint	50 parts
Paris white	40 parts
China clay	20 parts

To mill:

Frit	210 parts
Stone	104 parts
Flint	64 parts
Lead	95 parts

Raw Glazes.—White:

I.—White lead	160 parts
Borax	32 parts
Stone	48 parts
Flint	52 parts

Stain with blue and grind.

II.—White lead	80 parts
Litharge	60 parts
Boracic acid	40 parts
Stone	45 parts
Flint	50 parts

Treat as foregoing.

III.—White lead	100 parts
Borax	4 parts
Flint	11 parts
Cornwall stone	50 parts
IV.—Red lead	80 parts
Litharge	60 parts
Tincal	40 parts
Stone	40 parts
Flint	52 parts

ROCKINGHAM GLAZES.

I.—Litharge	50 parts
Stone	7½ parts
Red marl	3 parts
Oxide of manganese	5 parts
Red oxide of iron	1 part
II.—White lead	30 parts
Stone	3 parts
Flint	9 parts
Red marl	3 parts
Manganese	5 parts
III.—Red lead	20 parts
Stone	3 parts
Flint	2 parts
China clay	2 parts
Manganese	3 parts
Red oxide of iron	1 part

Stoneware Bodies.—

Ball clay	14 parts
China clay	10 parts
Stone	8 parts
Ball clay	8 parts
China clay	5 parts
Flint	3 parts
Stone	4 part
Ball clay	14 parts
China clay	11 parts
Flint	4 parts
Stone	5 parts
Feldspar	4 parts
Cane marl	16 parts
China clay	10 parts
Stone	9 parts
Flint	5 parts

Glazes.—Hard glaze:

Stone	10 parts
Flint	5 parts
Whiting	1½ parts
Red lead	10 parts

Hard glaze:

Feldspar	25 parts
Flint	5 parts
Red lead	15 parts
Plaster	1 part

Softer:

White lead	13 parts
Flint glass	10 parts
Feldspar	18 parts
Stone	3 parts
Whiting	1½ parts

Best:

Feldspar	20 parts
Flint glass	14 parts
White lead	14 parts
Stone	3 parts
Oxide of zinc	3 parts
Whiting	1½ parts
Plaster	1 part

Rockingham Bodies.—

Ball clay	20 parts
China clay	13 parts
Flint	7 parts
Stone	1 part
Cane marl	22 parts
China clay	15 parts
Flint	8 parts
Feldspar	1 part

Glazes.—

I.—Red lead	60	parts
Stone	8	parts
Red clay	3	parts
Best manganese	5	parts
II.—White lead	60	parts
Feldspar	6	parts
Flint	16	parts
Red clay	6	parts
Manganese	12	parts
III.—Red lead	100	parts
Stone	15	parts
Flint	10	parts
China clay	10	parts
Manganese	40	parts
Crocus martis	2	parts
IV.—Litharge	100	parts
Feldspar	14	parts
China clay	20	parts
Manganese	40	parts
Oxide of iron	2	parts

Jet.—Procure some first-class red marl, add water, and, by passing through a fine lawn, make it into a slip, and dip the ware therein.

When fired use the following:

Glaze.—

Stone	60	parts
Flint	30	parts
Paris white	7½	parts
Red lead	140	parts

One part mazarine blue stain to 10 parts glaze

Mazarine Blue Stain.—

Oxide of cobalt	10	parts
Paris white	9	parts
Sulphate barytes	1	part

Calcine.

Another Process Body.—

Ball clay	16	parts
China clay	12	parts
Flint clay	9	parts
Stone clay	6	parts
Black stain	7	parts

Glaze.—

Litharge	70	parts
Paris white	3	parts
Flint	12	parts
Stone	30	parts
Black stain	20	parts

Black Stain.—

Chromate of iron	12	parts
Oxide of nickel	2	parts
Oxide of tin	2	parts
Carbonate of cobalt	5	parts
Oxide of manganese	2	parts

Calcine and grind.

Blue Stains.—

I.—Oxide of cobalt	2½	parts
Oxide of zinc	7½	parts
Stone	7½	parts

Fire this very hard.

II.—Zinc	6	pounds
Flint	4	pounds
China clay	4	pounds
Oxide of cobalt	5	ounces

Hard fire.

III.—Whiting	3¾	parts
Flint	3¾	parts
Oxide of cobalt	2½	parts

Glost fire.

Turquoise Stain.—

Prepared cobalt	1½	parts
Oxide of zinc	6	parts
China clay	6	parts
Carbonate of soda	1	part

Hard fire.

MATERIALS:

Tin Ash.—

Old lead	4	parts
Grain tin	2	parts

Melt in an iron ladle, and pour out in water, then spread on a dish, and calcine in glost oven with plenty of air.

Oxide of Tin.—

Granulated tin	5	pounds
Niter	½	pound

Put on saucers and fire in glost oven.

Oxide of Chrome is made by mixing powdered bichromate of potash with sulphur as follows:

Potash	6	parts
Flowers of sulphur	1	part

Put in saggar, inside kiln, so that fumes are carried away, and place 4 or 5 pieces of red-hot iron on the top so as to ignite it. Leave about 12 hours, then pound very fine, and put in saggar again. Calcine in hard place of biscuit oven. Wash this until the water is quite clear, and dry for use.

Production of Luster Colors on Porcelain and Glazed Pottery.—The luster colors are readily decomposed by acids and atmospheric influences, because they do not contain, in consequence of the low baking temperature, enough silicic acid to form resistive compounds. In order to attain this, G. Alefeld has patented a process according to which such compounds are added to the luster preparations as leave behind after the burning an acid which transforms the luster preparation into more resisting

compounds. In this connection the admixture of such bodies has been found advantageous, as they form phosphides with the metallic oxides of the lusters after the burning. These phosphides are especially fitted for the production of saturated resisting compounds, not only on account of their insolubility in water, but also on account of their colorings. Similarly titanic, molybdic, tungstic, and vanadic compounds may be produced. The metallic phosphates produced by the burning give a luster coating which, as regards gloss, is not inferior to the non-saturated metallic oxides, while it materially excels them in power of resistance. Since the lusters to be applied are used dissolved in essential oils, it is necessary to make the admixture of phosphoric substance also in a form soluble in essential oils. For the production of this admixture the respective chlorides, preeminently phosphoric chloride, are suitable. They are mixed with oil of lavender in the ratio of 1 to 5, and the resulting reaction product is added to the commercial metallic oxide luster, singly or in conjunction with precious metal preparations (glossy gold, silver, platinum, etc.) in the approximate proportion of 5 to 1. Then proceed as usual. Instead of the chlorides, nitrates and acetates, as well as any readily destructible organic compounds, may also be employed, which are entered into fusing rosin or rosinous liquids.

Metallic Luster on Pottery.—According to a process patented in Germany, a mixture is prepared from various natural or artificial varieties of ocher, to which 25–50 per cent of finely powdered more or less metalliferous or sulphurous coal is added. The mass treated in this manner is brought together in saggars with finely divided organic substances, such as sawdust, shavings, wood-wool, cut straw, etc., and subjected to feeble red heat. After the heating the material is taken out. The glazings now exhibit that thin but stable metallic color which is governed by the substances used. Besides coal, salts and oxides of silver, cobalt, cadmium, chrome iron, nickel, manganese, copper, or zinc may be employed. The color-giving layer is removed by washing or brushing, while the desired color is burned in and remains. In this manner handsome shades can be produced.

Metallic Glazes on Enamels.—The formulas used by the Arabs and their Italian successors are partly disclosed in manuscripts in the British and South Kensington Museums; two are given below:

	Arab	Italian
Copper sulphide.....	26.87	24.74
Silver sulphide.....	1.15	1.03
Mercury sulphide.....	....	24.74
Red ocher.....	71.98	49.49

These were ground with vinegar and applied with the brush to the already baked enamel. A great variety of iridescent and metallic tones can be obtained by one or the other, or a mixture of the following formulas:

	I	II	III	IV	V	VI
Copper carbonate..	30	..	..	28	..	95
Copper oxalate....	..	..	..	..	5	..
Copper sulphide...	..	..	20	..	..	..
Silver carbonate...	..	3	..	2	1	5
Bismuth subnitrate.	..	12	..	..	10	..
Stannous oxide....	..	..	25	..	..	..
Red ocher.....	70	85	55	70	84	..

Silver chloride and yellow ocher may be respectively substituted for silver carbonate and red ocher. The ingredients, ground with a little gum tragacanth and water, are applied with a brush to enamels melting about 1814° F., and are furnaced at 1202° F. in a reducing atmosphere. After cooling the ferruginous deposit is rubbed off, and the colors thus brought out.

Sulphur, free or combined, is not necessary, cinnabar has no action, ocher may be dispensed with, and any organic gummy matter may be used instead of vinegar, and broom is not needed in the furnace. The intensity and tone of the iridescence depend on the duration of the reduction, and the nature of the enamel. Enamels containing a coloring base—copper, iron, antimony, nickel—especially in presence of tin, give the best results.

To Toughen China.—To toughen china or glass place the new article in cold water, bring to boil gradually, boil for 4 hours, and leave standing in the water till cool. Glass or china toughened in this way will never crack with hot water.

How to Tell Pottery and Porcelain.—The following simple test will serve: Hold the piece up to the light, and if it can be seen through—that is, if it is translucent—it is porcelain. Pottery is opaque, and not so hard and white as porcelain. The main differences in the manufacture of stoneware, earthenware, and porcelain are due to the ingredients used, to the way they are mixed, and to the degree of heat to which they are sub-

jected in firing. Most of the old English wares found in this country are pottery or semichina, although the term china is commonly applied to them all.

Cheese

Manufacture.—The process of cheese making is one which is eminently interesting and scientific, and which, in every gradation, depends on principles which chemistry has developed and illustrated. When a vegetable or mineral acid is added to milk, and heat applied, a coagulum is formed, which, when separated from the liquid portion, constitutes cheese. Neutral salts, earthy and metallic salts, sugar, and gum arabic, as well as some other substances, also produce the same effect; but that which answers the purpose best, and which is almost exclusively used by dairy farmers, is rennet, or the mucous membrane of the last stomach of the calf. Alkalies dissolve this curd at a boiling heat, and acids again precipitate it. The solubility of casein in milk is occasioned by the presence of the phosphates and other salts of the alkalies. In fresh milk these substances may be readily detected by the property it possesses of restoring the color of reddened litmus paper. The addition of an acid neutralizes the alkali, and so precipitates the curd in an insoluble state. The philosophy of cheese making is thus expounded by Liebig:

"The acid indispensable to the coagulation of milk is not added to the milk in the preparation of cheese, but it is formed in the milk at the expense of the milk-sugar present. A small quantity of water is left in contact with a small quantity of a calf's stomach for a few hours, or for a night; the water absorbs so minute a portion of the mucous membrane as to be scarcely ponderable; this is mixed with milk; its state of transformation is communicated (and this is a most important circumstance) not to the cheese, but to the milk-sugar, the elements of which transpose themselves into lactic acid, which neutralizes the alkalies, and thus causes the separation of the cheese. By means of litmus paper the process may be followed and observed through all its stages; the alkaline reaction of the milk ceases as soon as the coagulation begins. If the cheese is not immediately separated from the whey, the formation of lactic acid continues, the fluid turns acid, and the cheese itself passes into a state of decomposition.

"When cheese-curd is kept in a cool place a series of transformation takes place, in consequence of which it assumes entirely new properties; it gradually becomes semi-transparent, and more or less soft, throughout the whole mass; it exhibits a feebly acid reaction, and develops the characteristic caseous odor. Fresh cheese is very sparingly soluble in water, but after having been left to itself for two or three years it becomes (especially if all the fat be previously removed) almost completely soluble in cold water, forming with it a solution which, like milk, is coagulated by the addition of the acetic or any mineral acid. The cheese, which whilst fresh is insoluble, returns during the maturation, or ripening, as it is called, to a state similar to that in which it originally existed in the milk. In those English, Dutch, and Swiss cheeses which are nearly inodorous, and in the superior kinds of French cheese, the casein of the milk is present in its unaltered state.

"The odor and flavor of the cheese is due to the decomposition of the butter; the non-volatile acids, the margaric and oleic acids, and the volatile butyric acid, capric and caproic acids are liberated in consequence of the decomposition of glycerine. Butyric acid imparts to cheese its characteristic caseous odor, and the differences in its pungency or aromatic flavor depend upon the proportion of free butyric, capric, and caproic acids present. In the cheese of certain dairies and districts, valerianic acid has been detected along with the other acids just referred to. Messrs Jljenjo and Laskowski found this acid in the cheese of Limbourg, and M. Bolard in that of Roquefort.

"The transition of the insoluble into soluble casein depends upon the decomposition of the phosphate of lime by the margaric acid of the butter; margarate of lime is formed, whilst the phosphoric acid combines with the casein, forming a compound soluble in water.

"The bad smell of inferior kinds of cheese, especially those called meager or poor cheeses, is caused by certain fetid products containing sulphur, and which are formed by the decomposition or putrefaction of the casein. The alteration which the butter undergoes (that is, in becoming rancid), or which occurs in the milk-sugar still present, being transmitted to the casein, changes both the composition of the latter substance and its nutritive qualities.

"The principal conditions for the preparation of the superior kinds of cheese

(other obvious circumstances being of course duly regarded) are a careful removal of the whey, which holds the milk-sugar in solution, and a low temperature during the maturation or ripening of the cheese."

Cheese differs vastly in quality and flavor according to the method employed in its manufacture and the richness of the milk of which it is made. Much depends upon the quantity of cream it contains, and, consequently, when a superior quality of cheese is desired cream is frequently added to the curd. This plan is adopted in the manufacture of Stilton cheese and others of a like description. The addition of a pound or two of butter to the curd for a middling size cheese also vastly improves the quality of the product. To insure the richness of the milk, not only should the cows be properly fed, but certain breeds chosen. Those of Alderney, Cheddar, Cheshire, etc., have been widely preferred.

The materials employed in making cheese are milk and rennet. Rennet is used either fresh or salted and dried; generally in the latter state. The milk may be of any kind, according to the quality of the cheese required. Cows' milk is that generally employed, but occasionally ewes' milk is used; and sometimes, though more rarely, that from goats.

In preparing his cheese the dairy farmer puts the greater portion of the milk into a large tub, to which he adds the remainder, sufficiently heated to raise the temperature to that of new milk. The whole is then whisked together, the rennet or rennet liquor added, and the tub covered over. It is now allowed to stand until completely "turned," when the curd is gently struck down several times with the skimming dish, after which it is allowed to subside. The vat, covered with cheese cloth, is next placed on a "horse" or "ladder" over the tub, and filled with curd by means of the skimmer, care being taken to allow as little as possible of the oily particles or butter to run back with the whey. The curd is pressed down with the hands, and more added as it sinks. This process is repeated until the curd rises to about two inches above the edge. The newly formed cheese, thus partially separated from the whey, is now placed in a clean tub, and a proper quantity of salt, as well as of annotta, added when that coloring is used, after which a board is placed over and under it, and pressure applied for about 2 or 3 hours. The cheese is next turned out and surrounded by a fresh cheese cloth, and then again submitted to pressure in the cheese press for 8 or 10 hours, after which it is commonly removed from the press, salted all over, and again pressed for 15 to 20 hours. The quality of the cheese especially depends on this part of the process, as if any of the whey is left in the cheese it rapidly becomes bad-flavored. Before placing it in the press the last time the common practice is to pare the edges smooth and sightly. It now only remains to wash the outside of the cheese in warm whey or water, to wipe it dry, and to color it with annotta or reddle, as is usually done.

The storing of the newly made cheese is the next point that engages the attention of the maker and wholesale dealer. The same principles which influence the maturation or ripening of fermented liquors also operate here. A cool cellar, neither damp nor dry, and which is uninfluenced by change of weather or season, is commonly regarded as the best for the purpose. If possible, the temperature should on no account be permitted to exceed 50° or 52° F. at any portion of the year. An average of about 45° F. is preferable when it can be procured. A place exposed to sudden changes of temperature is as unfit for storing cheese as it is for storing beer. "The quality of Roquefort cheese, which is prepared from sheep's milk, and is very excellent, depends exclusively upon the places where the cheeses are kept after pressing and during maturation. These are cellars, communicating with mountain grottoes and caverns which are kept constantly cool, at about 41° to 42° F., by currents of air from clefts in the mountains. The value of these cellars as storehouses varies with their property of maintaining an equable and low temperature."

It will thus be seen that very slight differences in the materials, in the preparation, or in storing of the cheese, materially influence the quality and flavor of this article. The richness of the milk; the addition to or subtraction of cream from the milk; the separation of the curd from the whey with or without compression; the salting of the curd; the collection of the curd, either whole or broken, before pressing; the addition of coloring matter, as annotta or saffron, or of flavoring; the place and method of storing; and the length of time allowed for maturation, all tend to alter the taste and odor of the cheese in some or other particular, and that in a way readily percep-

tible to the palate of the connoisseur. No other alimentary substance appears to be so seriously affected by slight variations in the quality of the materials from which it is made, or by such apparently trifling differences in the methods of preparing.

The varieties of cheese met with in commerce are very numerous, and differ greatly from each other in richness, color, and flavor. These are commonly distinguished by names indicative of the places in which they have been manufactured, or of the quality of the materials from which they have been prepared. Thus we have Dutch, Gloucester, Stilton, skimmed milk, raw milk, cream, and other cheeses; names which explain themselves. The following are the principal varieties:

American Factory.—Same as Cheddar.

Brickbat.—Named from its form; made, in Wiltshire, of new milk and cream.

Brie.—A soft, white, cream cheese of French origin.

Cheddar.—A fine, spongy kind of cheese, the eyes or vesicles of which contain a rich oil; made up into round, thick cheeses of considerable size (150 to 200 pounds).

Cheshire.—From new milk, without skimming, the morning's milk being mixed with that of the preceding evening's, previously warmed, so that the whole may be brought to the heat of new milk. To this the rennet is added, in less quantity than is commonly used for other kinds of cheese. On this point much of the flavor and mildness of the cheese is said to depend. A piece of dried rennet, of the size of a half-dollar put into a pint of water over night, and allowed to stand until the next morning, is sufficient for 18 or 20 gallons of milk; in large, round, thick cheeses (100 to 200 pounds each). They are generally solid, homogeneous, and dry, and friable rather than viscid.

Cottenham.—A rich kind of cheese, in flavor and consistence not unlike Stilton, from which, however, it differs in shape, being flatter and broader than the latter.

Cream.—From the "strippings" (the last of the milk drawn from the cow at each milking), from a mixture of milk and cream, or from raw cream only, according to the quality desired. It is usually made in small oblong, square, or rounded cakes, a general pressure only (that of a 2- or 4-pound weight) being applied to press out the whey. After 12 hours it is placed upon a board or wooden trencher, and turned every day until dry. It ripens in about 3 weeks. A little salt is generally added, and frequently a little powdered lump sugar.

Damson.—Prepared from damsons boiled with a little water, the pulp passed through a sieve, and then boiled with about one-fourth the weight of sugar, until the mixture solidifies on cooling; it is next poured into small tin molds previously dusted out with sugar. Cherry cheese, gooseberry cheese, plum cheese, etc., are prepared in the same way, using the respective kinds of fruit. They are all very agreeable candies or confections.

Derbyshire.—A small, white, rich variety, very similar to Dunlop cheese.

Dunlop.—Rich, white, and buttery in round forms, weighing from 30 to 60 pounds.

Dutch (Holland).—Of a globular form, 5 to 14 pounds each. Those from Edam are very highly salted; those from Gouda less so.

Emmenthaler.—Same as Gruyère.

Gloucester.—Single Gloucester, from milk deprived of part of its cream; double Gloucester, from milk retaining the whole of the cream. Mild tasted, semi-buttery consistence, without being friable; in large, round, flattish forms.

Green or Sage.—From milk mixed with the juice of an infusion or decoction of sage leaves, to which marigold flowers and parsley are frequently added.

Gruyère.—A fine kind of cheese made in Switzerland, and largely consumed on the Continent. It is firm and dry, and exhibits numerous cells of considerable magnitude.

Holland.—Same as Dutch.

Leguminous.—The Chinese prepare an actual cheese from peas, called taofoo, which they sell in the streets of Canton. The paste from steeped ground peas is boiled, which causes the starch to dissolve with the casein; after straining the liquid it is coagulated by a solution of gypsum; this coagulum is worked up like sour milk, salted, and pressed into molds.

Limburger.—A strong variety of cheese, soft and well ripened.

Lincoln.—From new milk and cream; in pieces about 2 inches thick. Soft, and will not keep over 2 or 3 months.

Neufchâtel.—A much-esteemed variety of Swiss cheese; made of cream, and weighs about 5 or 6 ounces.

Norfolk.—Dyed yellow with annotta or saffron; good, but not superior; in cheeses of 30 to 50 pounds.

Parmesan.—From the curd of skimmed milk, hardened by a gentle heat. The rennet is added at about 120°, and an hour afterwards the curdling milk is set on a slow fire until heated to about 150° F., during which the curd separates in small lumps. A few pinches of saffron are then thrown in. About a fortnight after making the outer crust is cut off, and the new surface varnished with linseed oil, and one side colored red.

Roquefort.—From ewes' milk; the best prepared in France. It greatly resembles Stilton, but is scarcely of equal richness or quality, and possesses a peculiar pungency and flavor.

Roquefort, Imitation.—The gluten of wheat is kneaded with a little salt and a small portion of a solution of starch, and made up into cheeses. It is said that this mixture soon acquires the taste, smell, and unctuosity of cheese, and when kept a certain time is not to be distinguished from the celebrated Roquefort cheese, of which it possesses all the peculiar pungency. By slightly varying the process other kinds of cheese may be imitated.

Sage.—Same as green cheese.

Slipcoat or Soft.—A very rich, white cheese, somewhat resembling butter; for present use only.

Stilton.—The richest and finest cheese made in England. From raw milk to which cream taken from other milk is added; in cheeses generally twice as high as they are broad. Like wine, this cheese is vastly improved by age, and is therefore seldom eaten before it is 2 years old. A spurious appearance of age is sometimes given to it by placing it in a warm, damp cellar, or by surrounding it with masses of fermenting straw or dung.

Suffolk.—From skimmed milk; in round, flat forms, from 24 to 30 pounds each. Very hard and horny.

Swiss.—The principal cheeses made in Switzerland are the Gruyère, the Neufchâtel, and the Schabzieger or green cheese. The latter is flavored with melitot.

Westphalian.—Made in small balls or rolls of about 1 pound each. It derives its peculiar flavor from the curd being allowed to become partially putrid before being pressed. In small balls or rolls of about 1 pound each.

Wiltshire.—Resembles Cheshire or Gloucester. The outside is painted with reddle or red ocher or whey.

York.—From cream. It will not keep.

We give below the composition of some of the principal varieties of cheese:

	Cheddar	Double Gloucester	Skim
Water	36.64	35.61	43.64
Casein	23.38	21.76	45.64
Fatty matter	35.44	38.16	5.76
Mineral matter	4.54	4.47	4.96
	100.00	100.00	100.00

	Stilton	Cotherstone
Water	32.18	38.28
Butter	37.36	30.89
Casein	24.31	23.93
Milk, sugar, and extractive matters	2.22	3.70
Mineral matter	3.93	3.20
	100.00	100.00

	Gruyère (Swiss)	Ordinary Dutch
Water	40.00	36.10
Casein	31.50	29.40
Fatty matter	24.00	27.50
Salts	3.00	.90
Non-nitrogenous organic matter and loss	1.50	6.10
	100.00	100.00

When a whole cheese is cut, and the consumption small, it is generally found to become unpleasantly dry, and to lose flavor before it is consumed. This is best prevented by cutting a sufficient quantity for a few days' consumption from the cheese, and keeping the remainder in a cool place, rather damp than dry, spreading a thin film of butter over the fresh surface, and covering it with a cloth or pan to keep off the dirt. This removes the objection existing in small families against purchasing a whole cheese at a time. The common practice of buying small quantities of cheese should be avoided, as not only a higher price is paid for any given quality, but there is little likelihood of obtaining exactly the same flavor twice running. Should cheese become too dry to be

agreeable, it may be used for stewing, or for making grated cheese, or Welsh rarebits.

Goats' Milk Cheese.—Goats' milk cheese is made as follows: Warm 20 quarts of milk and coagulate it with rennet, either the powder or extract. Separate the curds from the whey in a colander. After a few days the dry curd may be shaped into larger or smaller cheeses, the former only salted, the latter containing salt and caraway seed. The cheeses must be turned every day, and sprinkled with salt, and any mold removed. After a few days they may be put away on shelves to ripen, and left for several weeks. Pure goat's milk cheese should be firm and solid all the way through. Twenty quarts of milk will make about 4 pounds of cheese.

CHEESE COLORANT:
See Food.

CHEMICAL GARDENS:
See Gardens, Chemical.

CHERRY BALSAM:
See Balsam.

CHERRY CORDIAL:
See Wines and Liquors.

Chewing Gums

Manufacture.—The making of chewing gum is by no means the simple operation which it seems to be. Much experience in manipulation is necessary to succeed, and the published formulas can at best serve as a guide rather than as something to be absolutely and blindly followed. Thus, if the mass is either too hard or soft, change the proportions until it is right; often it will be found that different purchases of the same article will vary in their characteristics when worked up. But given a basis, the manufacturer can flavor and alter to suit himself. The most successful manufacturers attribute their success to the employment of the most approved machinery and the greatest attention to details. The working formulas and the processes of these manufacturers are guarded as trade secrets, and aside from publishing general formulas, little information can be given.

Chicle gum is purified by boiling with water and separating the foreign matter. Flavorings, pepsin, sugar, etc., are worked in under pressure by suitable machinery. Formula:

I.—Gum chicle	1 pound
Sugar	2 pounds
Glucose	1 pound
Caramel butter	1 pound

First mash and soften the gum at a gentle heat. Place the sugar and glucose in a small copper pan; add enough water to dissolve the sugar; set on a fire and cook to 244° F.; lift off the fire; add the caramel butter and lastly the gum; mix well into a smooth paste; roll out on a smooth marble, dusting with finely powdered sugar, run through sizing machine to the proper thickness, cut into strips, and again into thin slices.

II.—Chicle	6 ounces
Paraffine	2 ounces
Balsam of Tolu	2 drachms
Balsam of Peru	1 drachm
Sugar	20 ounces
Glucose	8 ounces
Water	6 ounces
Flavoring, enough.	

Triturate the chicle and balsams in water, take out and add the paraffine, first heated. Boil the sugar, glucose, and water together to what is known to confectioners as "crack" heat, pour the syrup over the oil slab and turn into it the gum mixture, which will make it tough and plastic. Add any desired flavor.

III.—Gum chicle	122 parts
Paraffine	42 parts
Balsam of Tolu	4 parts
Sugar	384 parts
Water	48 parts

Dissolve the sugar in the water by the aid of heat and pour the resultant syrup on an oiled slab. Melt the gum, balsam, and paraffine together and pour on top of the syrup, and work the whole up together.

IV.—Gum chicle	240 parts
White wax	64 parts
Sugar	640 parts
Glucose	128 parts
Water	192 parts
Balsam of Peru	4 parts
Flavoring matter, enough.	

Proceed as indicated in II.

V.—Balsam of Tolu	4 parts
Benzoin	1 part
White wax	1 part
Paraffine	1 part
Powdered sugar	1 part

Melt together, mix well, and roll into sticks of the usual dimensions.

Mix, and, when sufficiently cool, roll out into sticks or any other desirable form.

Spruce Chewing Gum.—

Spruce gum	20 parts
Chicle	20 parts
Sugar, powdered	60 parts

Melt the gums separately, mix while hot, and immediately add the sugar, a small portion at a time, kneading it thoroughly on a hot slab. When completely incorporated remove to a cold slab, previously dusted with powdered sugar, roll out at once into sheets, and cut into sticks. Any desired flavor or color may be added to or incorporated with the sugar.

CHICKEN-COOP APPLICATION:
See Insecticides.

CHICKEN DISEASES AND THEIR REMEDIES:
See Veterinary Formulas.

CHICORY, TESTS FOR:
See Foods.

CHILBLAINS:
See Ointments.

CHILBLAIN SOAP:
See Soap.

CHILDREN, DOSES FOR:
See Doses.

CHILLS, BITTERS FOR:
See Wines and Liquors.

CHINA CEMENTS:
See Adhesives and Lutes.

CHINA:
See Ceramics.

CHINA, TO REMOVE BURNED LETTERS FROM:
See Cleaning Preparations and Methods, under Miscellaneous Methods.

CHINA REPAIRING:
See Porcelain.

CHINA RIVETING.

China riveting is best left to practical men, but it can be done with a drill made from a splinter of a diamond fixed on a handle. If this is not to be had, get a small three-cornered file, harden it by placing it in the fire till red hot, and then plunging it in cold water. Next grind the point on a grindstone and finish on an oilstone. With the point pick out the place to be bored, taking care to do it gently for fear of breaking the article. In a little while a piece will break off, then the hole can easily be made by working the point round. The wire may then be passed through and fastened. A good cement may be made from 1 ounce of grated cheese, ½ ounce of finely powdered quicklime, and white of egg sufficient to make a paste. The less cement applied the better, using a feather to spread it over the broken edge.

CHLORIDES, PLATT'S:
See Disinfectants.

CHLORINE-PROOFING:
See Acid-Proofing.

CHOCOLATE.

Prepare 1,000 parts of finished cacao and 30 parts of fresh cacao oil, in a warmed, polished, iron mortar, into a liquid substance, add to it 800 parts of finely powdered sugar, and, after a good consistency has been reached, 60 parts of powdered iron lactate and 60 parts of sugar syrup, finely rubbed together. Scent with 40 parts of vanilla sugar. Of this mass weigh out tablets of 125 parts into the molds.

Coating Tablets with Chocolate.—If a chocolate which is free from sugar be placed in a dish over a water bath, it will melt into a fluid of proper consistence for coating tablets. No water must be added. The coating is formed by dipping the tablets. When they are sufficiently hardened they are laid on oiled paper to dry.

CHOCOLATE CASTOR-OIL LOZENGES:
See Castor Oil.

CHOCOLATE CORDIAL:
See Wines and Liquors.

CHOCOLATE EXTRACTS:
See Essences and Extracts.

CHOCOLATE SODA WATER:
See Beverages.

CHOKING IN CATTLE:
See Veterinary Formulas.

CHOLERA REMEDIES:

Sun Cholera Mixture.—

Tincture of opium	1 part
Tincture of capsicum	1 part
Tincture of rhubarb	1 part
Spirit of camphor	1 part
Spirit of peppermint	1 part

Squibb's Diarrhea Mixture.—

Tincture opium	40 parts
Tincture capsicum	40 parts
Spirit camphor	40 parts
Chloroform	15 parts
Alcohol	65 parts

Aromatic Rhubarb.—

Cinnamon, ground..	8 parts
Rhubarb.....	8 parts
Calumba.....	4 parts
Saffron.....	1 part
Powdered opium....	2 parts
Oil peppermint.....	5 parts
Alcohol, q. s. ad....	100 parts

Macerate the ground drugs with 75 parts alcohol in a closely covered percolator for several days, then allow percolation to proceed, using sufficient alcohol to obtain 95 parts of percolate. In percolate dissolve the oil of peppermint.

Rhubarb and Camphor.—

Tincture capsicum...	2 ounces
Tincture opium.....	2 ounces
Tincture camphor....	3 ounces
Tincture catechu.....	4 ounces
Tincture rhubarb....	4 ounces
Spirit peppermint....	4 ounces

Blackberry Mixture.—

Fluid extract blackberry root.....	2 pints
Fluid ginger, soluble.	5⅓ ounces
Fluid catechu.....	5⅓ ounces
Fluid opium for tincture.....	160 minims
Brandy.....	8 ounces
Sugar.....	4 pounds
Essence cloves.....	256 minims
Essence cinnamon..	256 minims
Chloroform.....	128 minims
Alcohol (25 per cent), q. s. ad.....	1 gallon

CHOWCHOW:
See Condiments.

CHROME YELLOW, TEST FOR:
See Pigments.

CHROMIUM GLUE:
See Adhesives.

CHROMO MAKING.

The production of chromo pictures requires a little skill. Practice is necessary. The glass plate to be used should be washed off with warm water, and then laid in a 10 per cent solution of nitric acid. After one hour, wash with clean, cold water, dry with a towel, and polish the plate with good alcohol on the inside—hollow side—until no finger marks or streaks are visible. This is best ascertained by breathing on the glass; the breath should show an even blue surface on the glass.

Coat the unmounted photograph to be colored with benzine by means of wadding, but without pressure, so that the retouching of the picture is not disturbed. Place 2 tablets of ordinary kitchen gelatin in 8¾ ounces of distilled or pure rain water, soak for an hour, and then heat until the gelatin has completely dissolved. Pour this warm solution over the polished side of the glass, so that the liquid is evenly distributed. The best way is to pour the solution on the upper right-hand corner, allowing it to flow into the left-hand corner, from there to the left below and right below, finally letting the superfluous liquid run off. Take the photograph, which has been previously slightly moistened on the back, lay it with the picture side on the gelatin-covered plate, centering it nicely, and squeeze out the excess gelatin solution gently, preferably by means of a rubber squeegee. Care must be taken, however, not to displace the picture in this manipulation, as it is easily spoiled.

The solution must never be allowed to boil, since this would render the gelatin brittle and would result in the picture, after having been finished, cracking off from the glass in a short time. When the picture has been attached to the glass plate without blisters (which is best observed from the back), the edge of the glass is cleansed of gelatin, preferably by means of a small sponge and lukewarm water, and the plate is allowed to dry over night.

When the picture and the gelatin are perfectly dry, coat the back of the picture a few times with castor oil until it is perfectly transparent; carefully remove the oil without rubbing, and proceed with the painting, which is best accomplished with good, not over-thick oil colors. The coloring must be observed from the glass side, and for this reason the small details, such as eyes, lips, beard, and hair, should first be sketched in. When the first coat is dry the dress and the flesh tints are painted. The whole surface may be painted over, and it is not necessary to paint shadows, as these are already present in the picture, and consequently show the color through in varying strength.

When the coloring has dried, a second glass plate should be laid on for protection, pasting the two edges together with narrow strips of linen.

Cider

To Make Cider.—Pick the apples off the tree by hand. Every apple before going into the press should be carefully

wiped. As soon as a charge of apples is ground, remove the pomace and put in a cask with a false bottom and a strainer beneath it, and a vessel to catch the drainage from pomace. As fast as the juice runs from the press place it in clean, sweet, open tubs or casks with the heads out and provide with a faucet, put in about two inches above bottom. The juice should be closely watched and as soon as the least sign of fermentation appears (bubbles on top, etc.) it should be run off into casks prepared for this purpose and placed in a moderately cool room. The barrels should be entirely filled, or as near to the bunghole as possible. After fermentation is well under way the spume or foam should be scraped off with a spoon several times a day. When fermentation has ceased the cider is racked off into clean casks, filled to the bunghole, and the bung driven in tightly. It is now ready for use or for bottling.

Champagne Cider.—I.—To convert ordinary cider into champagne cider, proceed as follows: To 100 gallons of good cider add 3 gallons of strained honey (or 24 pounds of white sugar will answer), stir in well, tightly bung, and let alone for a week. Clarify the cider by adding a half gallon of skimmed milk, or 4 ounces of gelatin dissolved in sufficient hot water and add 4 gallons of proof spirit. Let stand 3 days longer, then syphon off, bottle, cork, and tie or wire down. Bunging the cask tightly is done in order to induce a slow fermentation, and thus retain in the cider as much carbonic acid as possible.

II.—Put 10 gallons of old and clean cider in a strong and iron-bound cask, pitched within (a sound beer cask is the very thing), and add and stir in well 40 ounces of simple syrup. Add 5 ounces of tartaric acid, let dissolve, then add 7½ ounces sodium bicarbonate in powder. Have the bung ready and the moment the soda is added put it in and drive it home. The cider will be ready for use in a few hours.

Cider Preservative.—I.—The addition of 154 grains of bismuth subnitrate to 22 gallons of cider prevents, or materially retards, the hardening of the beverage on exposure to air; moreover, the bismuth salt renders alcoholic fermentation more complete.

II.—Calcium sulphite (sulphite of lime) is largely used to prevent fermentation in cider. About ⅛ to ¼ of an ounce of the sulphite is required for 1 gallon of cider. It should first be dissolved in a small quantity of cider, then added to the bulk, and the whole agitated until thoroughly mixed. The barrel should then be bunged and allowed to stand for several days, until the action of the sulphite is exerted. It will preserve the sweetness of cider perfectly, but care should be taken not to add too much, as that would impart a slight sulphurous taste.

Artificial Ciders.—To 25 gallons of soft water add 2 pounds of tartaric acid, 25 or 30 pounds of sugar, and a pint of yeast; put in a warm place, and let ferment for 15 days, then add the flavoring matter to suit taste. The various fruit ethers are for sale at any wholesale drug house.

Bottling Sweet Cider.—Champagne quarts are generally used for bottling cider, as they are strong and will stand pressure, besides being a convenient size for consumers. In making cider champagne the liquor should be clarified and bottled in the sweet condition, that is to say, before the greater part of the sugar which it contains has been converted into alcohol by fermentation. The fermentation continues, to a certain extent, in the bottle, transforming more of the sugar into alcohol, and the carbonic acid, being unable to escape, is dissolved in the cider and produces the sparkling.

The greater the quantity of sugar contained in the liquor, when it is bottled, the more complete is its carbonation by the carbonic-acid gas, and consequently the more sparkling it is when poured out. But this is true only within certain limits, for if the production of sugar is too high the fermentation will be arrested.

To make the most sparkling cider the liquor is allowed to stand for three, four, five, or six weeks, during which fermentation proceeds. The time varies according to the nature of the apples, and also to the temperature; when it is very warm the first fermentation is usually completed in 7 days.

Before bottling, the liquid must be fined, and this is best done with catechu dissolved in cold cider, 2 ounces of catechu to the barrel of cider. This is well stirred and left to settle for a few days.

The cider at this stage is still sweet, and it is a point of considerable nicety not to carry the first fermentation too far. The bottle should not be quite filled, so as to allow more freedom for the carbonic-acid gas which forms.

When the bottles have been filled,

corked, and wired down, they should be placed in a good cellar, which should be dry, or else the cider will taste of the cork. The bottles should not be laid for four or five weeks, or breakage will ensue. When they are being laid they should be placed on laths of wood or on dry sand; they should never be allowed on cold or damp floors.

Should the cider be relatively poor in sugar, or if it has been fermented too far, about 1 ounce of powdered loaf sugar can be added to each bottle, or else a measure of sugar syrup before pouring in the cider.

Imitation Cider.—

I.—A formula for an imitation cider is as follows:

Rain water	100 gallons
Honey, unstrained	6 gallons
Catechu, powdered	3 ounces
Alum, powdered	5 ounces
Yeast (brewer's preferably)	2 pints

Mix and put in a warm place to ferment. Let ferment for about 15 days; then add the following, stirring well in:

Bitter almonds, crushed	8 ounces
Cloves	8 ounces

Let stand 24 hours, add two or three gallons of good whiskey, and rack off into clean casks. Bung tightly, let stand 48 hours, then bottle. If a higher color is desired use caramel sufficient to produce the correct tinge. If honey is not obtainable, use sugar-house molasses instead, but honey is preferable.

II.—The following, when properly prepared, makes a passable substitute for cider, and a very pleasant drink:

Catechu, powdered	3 parts
Alum, powdered	5 parts
Honey	640 parts
Water	12,800 parts
Yeast	32 parts

Dissolve the catechu, alum, and honey in the water, add the yeast, and put in some warm place to ferment. The container should be filled to the square opening, made by sawing out five or six inches of the center of a stave, and the spume skimmed off daily as it arises. In cooler weather from 2 weeks to 18 days will be required for thorough fermentation. In warmer weather from 12 to 13 days will be sufficient. When fermentation is complete add the following solution:

Oil of bitter almonds	1 part
Oil of clover	1 part
Caramel	32 parts
Alcohol	192 parts

The alcohol may be replaced by twice its volume of good bourbon whiskey. A much cheaper, but correspondingly poor substitute for the above may be made as follows:

Twenty-five gallons of soft water, 2 pounds tartaric acid, 25 pounds of brown sugar, and 1 pint of yeast are allowed to stand in a warm place, in a clean cask with the bung out, for 24 hours. Then bung up the cask, after adding 3 gallons of whiskey, and let stand for 48 hours, after which the liquor is ready for use.

CIDER VINEGAR:

See Vinegar.

Cigars

Cigar Sizes and Colors.—Cigars are named according to their color and shape. A dead-black cigar, for instance, is an "Oscuro," a very dark-brown one is a "Colorado," a medium brown is a "Colorado Claro," and a yellowish light brown is a "Claro." Most smokers know the names of the shades from "Claro" to "Colorado," and that is as far as most of them need to know. As to the shapes, a "Napoleon" is the biggest of all cigars—being 7 inches long; a "Perfecto" swells in the middle and tapers down to a very small head at the lighting end; a "Panatela" is a thin, straight, up-and-down cigar without the graceful curve of the "Perfecto"; a "Conchas" is very short and fat, and a "Londres" is shaped like a "Perfecto" except that it does not taper to so small a head at the lighting end. A "Reina Victoria" is a "Londres" that comes packed in a ribbon-tied bundle of 50 pieces, instead of in the usual four layers of 13, 12, 13 and 12.

How to Keep Cigars.—Cigars kept in a case are influenced every time the case is opened. Whatever of taint there may be in the atmosphere rushes into the case, and is finally taken up by the cigars. Even though the cigars have the appearance of freshness, it is not the original freshness in which they were received from the factory. They have been dry, or comparatively so, and have absorbed more moisture than has been put in the case, and it matters not what that moisture may be, it can never restore the flavor that was lost during the drying-out process.

After all, it is a comparatively simple matter to take good care of cigars. All that is necessary is a comparatively air-tight, zinc-lined chest. This should be